Background

The U.S. Environmental Protection Agency (USEPA) and its consultant (CH2MHill) have developed a calibrated groundwater flow model (referred to as the USEPA Rialto-Colton Model, or EPA RCM) for the Rialto-Colton Groundwater Basin (Basin), which is a hybrid of the existing models, including the U.S. Geological Survey (USGS) basinwide model (Woolfenden and Koczot, 2001), the GeoLogic (2007, 2010) model, and the CH2MHill (2010) model. The EPA RCM (CH2MHill, 2012) was developed with the USGS's MODFLOW-NWT groundwater modeling program. The USEPA is currently using the EPA RCM to design and evaluate the perchlorate and volatile organic compound (VOC) interim source-area groundwater remedy associated with the B.F. Goodrich superfund site (the EPA remedy) (Figure 1).

Two other nearby remedial actions are currently in operation in the Basin. First, San Bernardino County operates a groundwater treatment system for perchlorate and VOC impacts at Rialto Well No. 3, located at the Rialto Airport. Also, the County of San Bernardino is using Fontana Union Water Company wells as part of a corrective action program (CAP) further to the west that includes groundwater extraction of VOC-contaminated groundwater for contaminants emanating from near the footprint of Unit 1 of the County Mid-Valley Sanitary Landfill. Both of these remedial actions are located to the southwest of the EPA remedy and north of Baseline Avenue. Including the EPA remedy, these three remedial actions occur/will occur in the area referred to locally as "North of Baseline" (Figure 1).

The allocation of groundwater pumped from the Basin during low-water conditions is governed by a stipulated judgment informally known as the 1961 Rialto Basin Decree, which was entered in San Bernardino County Superior Court (The Lytle Creek Water & Improvement Company vs. Fontana Ranchos Water Company, et al., Action 81264) (1961 Rialto Basin Decree). The 1961 Rialto Basin Decree stipulates that parties to the Decree may pump unlimited volumes of groundwater from the Basin if the average of the spring-high groundwater elevation at three index wells exceeds 1,002.3 feet above mean sea level (MSL). When the average groundwater elevation at the index wells is between 969.7 and 1,002.3 feet above MSL, each party is entitled to the amount specified in the Decree. If the index-well average spring-high groundwater elevation falls below 969.7 feet above MSL, each party's entitlement is reduced by 1 percent for every foot the average is below 969.7 feet above MSL, to a limit of not more than 50 percent. The area governed by the 1961 Rialto Basin Decree is referred to as the Rialto-Colton Basin. The boundaries of this area are shown on Figure 2.

For 2012, groundwater elevations in the Basin are approximately 19 feet below the level stipulated in the 1961 Rialto Basin Decree (or 950.3 feet); forcing a 19% reduction in groundwater pumping by parties to the Decree (San Bernardino Valley Municipal Water District, 2012) (Att5_LGA12_WestValleyWD_WrkPln_2of2.pdf). The forthcoming EPA interim remedy, which is a pump-and-treat system, and future return to service of District Well No. 11 and Rialto Well No. 6 as part of a contaminant mass removal effort (south of Baseline Avenue) represent additional groundwater pumping.

In light of the challenges described above, the focus of the proposed Project is to develop an understanding of: 1) the hydrogeologic interaction of all four remedial pumping efforts; 2) the potential options for extracting any additional groundwater within the stipulated amounts; and to evaluate management options that will optimize continued stakeholder groundwater pumping, by strategically replenishing the basin through artificial recharge. The operating assumption is that strategic planning offers the potential for avoiding further litigation.

Modeling Objective

The primary objective of the Groundwater Model Integration and Enhancement Project is to use the calibrated EPA RCM (CH2MHill, 2012) to optimize the basin-wide groundwater management within the Basin caused by the North of Baseline remedial actions and the return to service of District Well No. 11 and Rialto Well No. 6. Together with other known and estimated groundwater pumping within the Basin, these actions are collectively described in this scope of work as Basin groundwater production.

The effects of Basin groundwater production on basin-wide groundwater management will be evaluated by predicting the simulated average spring-high groundwater elevations at the three index wells specified in the 1961 Rialto Basin Decree. Simulation scenarios of future groundwater levels will be defined that incorporate hypothetical climatic and Basin groundwater production variations and groundwater replenishment projects. In achieving the modeling objective, a comprehensive, practical understanding of Basin groundwater mechanics will be developed, in terms of groundwater flow dynamics and hydrologic response.

The proposed Project will serve as a tool for Basin stakeholders to evaluate future “what-if” scenarios, which will include potential locations for groundwater replenishment programs. Such programs may be an integral part of balancing the needs of Basin stakeholders under the constraints imposed by the 1961 Rialto Basin Decree.

Scope of Work

This Section defines the required tasks for the specific activities that will be performed to implement the Groundwater Model Integration and Enhancement Project. The task descriptions will be used as the scope of work in the grant agreement if the Proposal is selected for funding. The task detail allows the reviewer to fully understand the work to be performed in order to evaluate the adequacy of the Proposal. Additionally, the tasks provide sufficient detail to justify the project cost estimates. Tasks listed in this Work Plan are consistent with those used in **Attachment 6, Budget, and Attachment 7, Schedule**.

(a): Direct Project Administration Costs

a.1: Administration

Project administration includes administration of grant and construction contracts, preparation of reports and plans, coordination of design contracts, and other activities as required completing design and construction that may not be directly related to those tasks.

Deliverables: None.

a.2: Labor Compliance Program

Public Resources Code section 75075 requires that any entity awarding a contract for a public works project financed in any part with funds made available by Proposition 84 must adopt and enforce a Labor Compliance Plan. The District will contract with a labor compliance consultant to prepare the Labor Compliance Plan in accordance with the California Department of Water Resources (DWR) requirements.

Deliverables: Submission of Labor Compliance Program.

a.3: Reporting

The District will prepare and submit quarterly progress reports and invoices to DWR. The District will require the contractor to submit monthly progress reports to accompany each invoice. The progress reports will describe activities undertaken and accomplishments of each task during the milestones achieved, and any problems encountered in the performance of the work under this contract. A final summary report will be prepared and submitted once the Project is completed. Other items required by the grant contract will also be submitted to DWR.

Deliverables: Quarterly Progress Reports, and Final Summary Report at Completion.

(b): Land Purchase/Easement

No purchase or easement of land is required for this project.

(c): Model Design and Implementation

The general scope of the proposed Groundwater Model Integration and Enhancement Project is:

- Task c.4: Formalize Basin Technical Advisory Committee (BTAC)
- Task c.5: Review EPA RCM and evaluate its suitability for basin-wide planning.
- Task c.6: Conduct preliminary simulations to assist the BTAC with understanding the predicted effect of focused-Basin groundwater remediation-related production on water levels in the 1961 Rialto Basin Decree index wells.
- Task c.7: Optimize the North of Baseline remedial systems and groundwater production at District Well No. 11 and Rialto Well No. 6, with respect to Basin groundwater production and 1961 Rialto Basin Decree stipulated groundwater elevations.
- Task c.8: Develop and simulate “what-if” scenarios for future basin operations.
- Task c.9: Project Report.

c.4 – Formalize Basin Technical Advisory Committee

As defined by DWR Bulletin 118-08, the Rialto-Colton Basin is one of nine subbasins in the Upper Santa Ana Valley Groundwater Basin. In 2005, nine members of the Upper Santa Ana Water Resources Association (Association) met and formed a Regional Water Management Group for the purpose of developing an Integrated Regional Water Management Plan (IRWMP). The Regional Water Management Group is now called the Technical Advisory Group (TAG), with the regional lead agency, San Bernardino Valley Municipal Water District (Valley District), coordinating development of the IRWMP. The TAG members actively participated in development of the IRWMP. The District and Rialto are members of the TAG.

The District has also been informally meeting with other relevant agencies that overlay the Rialto-Colton Basin to discuss issues related to groundwater management in the Rialto-Colton

Basin and the Lytle Creek Groundwater Subbasin (which adjoins the Rialto-Colton Basin on the west). The Lytle-Rialto Basin Group consists of the District, Valley District, Cucamonga Valley Water District (CVWD), and Fontana Water Company (FWC). Fontana Union Water Company (Fontana Union) holds the water rights for the Rialto-Colton and Lytle Creek Basin. FWC utilizes Fontana Union's rights in the Lytle Creek Basin and CVWD utilizes Fontana Union's rights in the Rialto-Colton Basin by selling the water to FWC. FWC gets most of the water owned by Fontana Union out of the two basins.

As part of Task c.4 for this proposed Project, a memoranda of agreement will be developed to formalize the actions of the Lytle-Rialto Basin Group, define the data to be provided by each member and the types of in-kind services to be provided by each agency (e.g., provide technical staff to attend monthly meetings, review of consultant work products). The District will actively solicit membership to the group to include the City of Rialto and the City of Colton. The purpose of the Lytle-Rialto Basin Group will be to establish a technical advisory committee that uses the best data and tools available to manage the Rialto-Colton Basin (BTAC). The committee will be a forum whereby groundwater issues are dealt with at the technical level and a means to avoid costly litigation.

c.5 - Review EPA RCM

It is assumed that the EPA RCM is sufficiently calibrated and robust to allow the model's use for the proposed work. That is, significant modifications to the EPA RCM structure and input data will not be necessary.

The EPA RCM will be reviewed for the purpose of understanding the model's limitations and for formulating a plan for modifications deemed necessary to achieve the modeling objective. The model calibration will be re-evaluated relative to American Society for Testing and Materials (ASTM) D 5981-96 (Standard Guide for Calibrating a Ground-Water Flow Model Application). A sensitivity and uncertainty analysis will be performed using the modeling tools "Groundwater Vistas" and PEST.

Possible modifications include refining the model stress periods. CH2MHill (2012) indicates that yearly stress periods were used to calibrate the EPA RCM. Semi-annual or quarterly stress periods would facilitate model performance evaluation in terms of comparing simulated groundwater elevations to the groundwater elevations stipulated in the 1961 Rialto Basin Decree (i.e., the spring-high average groundwater elevations at three index wells).

The sensitivity of simulated groundwater elevations to boundary fluxes and internal impediments to groundwater flow (e.g., faults) will also be evaluated.

c.6 – Preliminary Simulations

The purpose of the preliminary simulations is to provide a framework to the BTAC for understanding the capabilities of the modeling tool. For this task, current and projected pumping in the Basin will be reviewed, which includes groundwater production for remedial and non-remedial uses.

A baseline scenario, guided by the model modifications in Task c.6, will be developed to represent the current basin conditions. Three additional scenarios representing possible Basin groundwater production configurations will be developed. The scenarios will follow the pumping

stipulations in the 1961 Rialto Basin Decree. Required reductions in pumping are based on the average of the spring-high groundwater elevations in three index wells:

- Unlimited pumping: average groundwater elevation for index wells exceeds 1,002.3 feet.
- Reduced pumping: average groundwater elevation for index wells is between 969.7 feet and 1,002.3 feet. Groundwater pumping is restricted to volumes stipulated in the Decree.
- Restricted pumping: average groundwater elevation for index wells is less than 969.7 feet. Each party's entitlement is reduced by 1% for every foot the average is below 969.7 feet.

The results of these three simulation scenarios will provide a demonstration of the simulated effects on groundwater elevations caused by focused pumping in and/around Baseline Road. Under the 1961 Rialto Basin Decree, the additional drawdown in groundwater elevations may trigger required reductions in pumping by parties to the Decree. In addition, these simulations may be used to evaluate the potential duration of the expected mass-removal effort at District Well No.11 and Rialto Well No. 6, given the potential success of the primary plume-cutoff goal for the USEPA Interim Remedy.

Work in Task c.6 may indicate that the numerical grid used for the EPA RCM needs to be refined to create a finer spatial discretization and potentially improve numerical stability. Any such refinements will be designed to achieve a balance between accuracy and stability relative to model execution times and setup complexities.

c.7 – Optimize Remedial Systems

The key question to be addressed in Task c.7 is: Can each stakeholder's groundwater requirements be met without artificial replenishment of groundwater? Thus, the goal of Task c.7 is to develop an understanding of how to optimize North of Baseline remediation while groundwater production for other stakeholders continues.

Simulated pumping rates for the North of Baseline remedial actions, District Well No. 11 and Rialto Well No. 6 will be adjusted systematically to approach a condition in which the decrease of groundwater elevations at the 1961 Rialto Basin Decree index wells is minimized. Current groundwater elevations in the Basin will be used as the initial condition this suite of simulations.

The pumping rates will be adjusted subject to the constraint that the North of Baseline remedial systems must achieve their remedial goals (e.g., minimum pumping rates, hydraulic containment, etc.). The degree of hydraulic containment will be assessed with the particle-tracking model MODPATH.

c.8 – Future Scenarios for Basin Operations

The goal of Task c.8 is to develop and simulate future "what-if" scenarios, which will include potential locations for groundwater replenishment programs. Such programs may be an integral part of balancing the needs of Basin stakeholders under the constraints imposed by the 1961 Rialto Basin Decree.

Up to eight (8) comprehensive model scenarios will be developed to evaluate aquifer response. These scenarios may include variations in pumping, climate conditions, replenishment activities or other factors in the Basin. Examples include:

- Locations of groundwater replenishment projects and volumes of water.
- Basin management under normal, wet, and dry conditions.
- Increased groundwater demand due to population growth.
- Hypothetical new remediation systems.

Each "what-if" scenario will include the three North of Baseline remedial systems and active groundwater production from District Well No. 11 and Rialto Well No. 6. Groundwater replenishment locations will be strategically placed with respect to remedial systems and production wells to target areas where groundwater depletion is most severe.

A sensitivity and uncertainty analysis will be conducted to develop an understanding of where basin management objectives are most likely to fail. This analysis will also help identify data gaps that if filled would lead to a more robust modeling tool. The sensitivity of simulated groundwater elevations to boundary fluxes and internal impediments to groundwater flow (e.g., faults) will also be evaluated.

The result of this analysis will provide a basis to determine the relative amount of water that goes into groundwater storage versus the quantity that is lost to remedial systems, production wells, and subsurface groundwater outflow. The analysis will evaluate long-term aquifer sustainability in response to changes in the water demand and/or distribution of groundwater production and remediation, and the potential benefits of groundwater replenishment projects. Also, the result will be presented to the BTAC so future basin-management recommendations can be made.

c.9 – Project Report

This task is intended to document the modeling process utilized to identify, evaluate, and prioritize projects and management actions. Stakeholder input, description of problems and issues identified, performance measures/evaluation criteria, model results, and future modeling project priorities will be included. Specific limitations based on choices made during model development will be discussed. Recommendations for improving the model will be included. Also, ways the model can be used as a tool will be detailed in the report.

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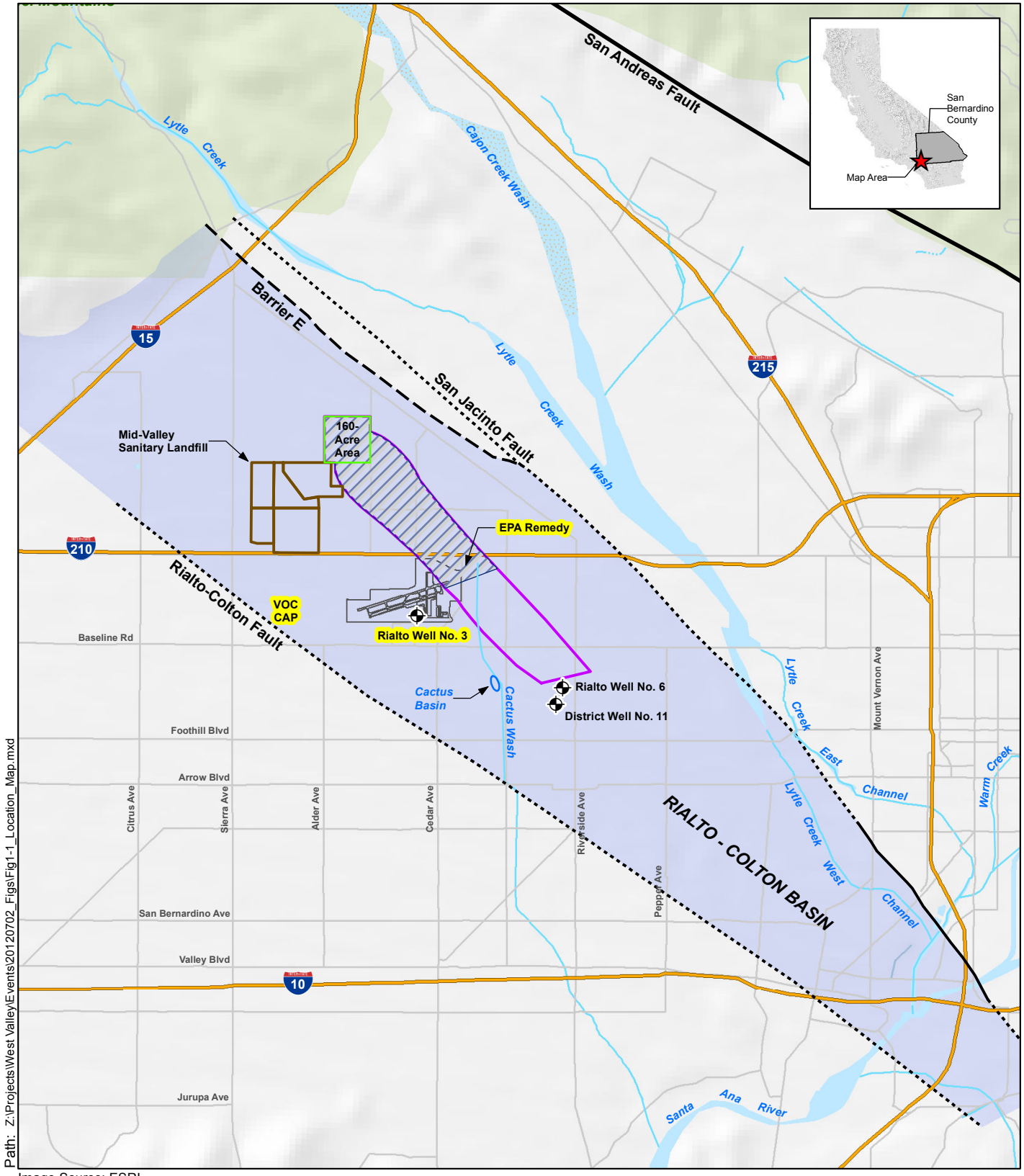

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Image Source: ESRI

Legend

- Project Wells
- Fault
- Fault (Approximate)
- Fault (Concealed)
- Interim Source Area Operable Unit
- Superfund Site

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Feet

Kennedy/Jenks Consultants

West Valley Water District and City of Rialto
Rialto, California

Project Site and Superfund Site

Figure 1

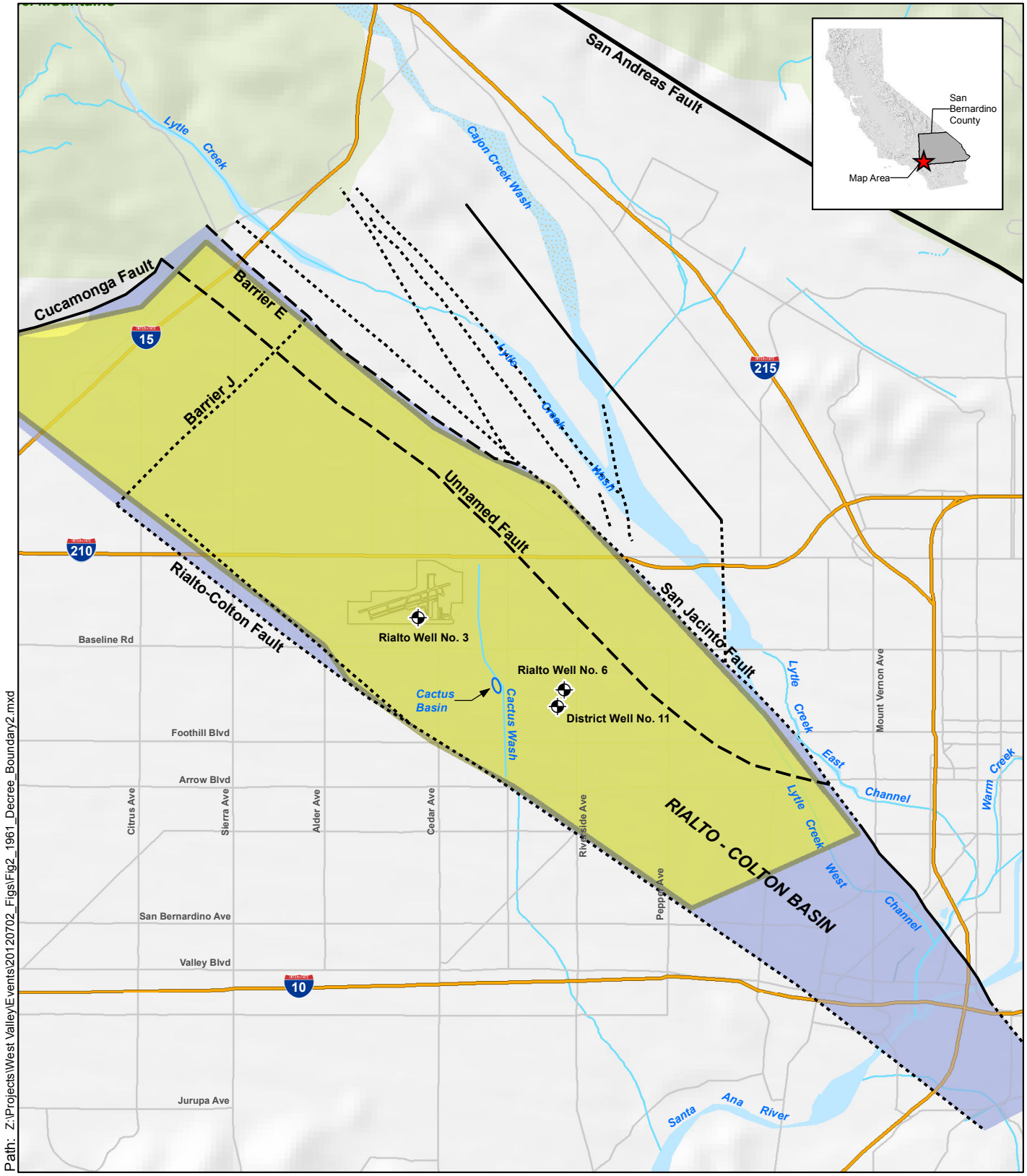

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Image Source: ESRI

Legend

- Project Wells
- Fault
- Fault (Approximate)
- Fault (Concealed)
- Rialto-Colton Basin
- Area Controlled by the Stipulated Judgement in *The Lytle Creek Water & Improvement Company vs. Fontana Ranchos Water Company, et al., Action 81264*

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West Valley Water District and City of Rialto
Rialto, California

1961 Decree Boundary

Figure 2